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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

JANUARY 1949

EROSION CONTROL PRACTICES DIVISION

Lespedeza Sericea Increasing in Importance as an Erosion Control Crop Plant - George W. Hood, Batesville, Arkansas. - "Lespedeza sericea is growing in importance for hay, early pasture, and gully and rough land planting in this area. The Service has encouraged the establishment of sericea, and called to the attention of our cooperators the value of this plant. From a few early plantings, less than 5 years ago, the District now has plantings on 85 farms, and most all of the farmers are increasing their plantings.

"This plant can be grown where alfalfa fails and the value of hay is almost equal to that of alfalfa. The cooperators have increased their plantings after trying a small acreage, indicating that sericea is growing in popularity as a farm crop."

Sweetclover Seedling Survival in Relation to Drill Rows and Phosphate Placement - J. R. Johnston, Temple, Texas. - "Very little small grain damage, other than tip-burn, has been observed to date. Winter peas and vetch came through in good shape. Sweetclover seedlings growing in drills with barley and oats which had been phosphated survived the cold. Ninety to 95 percent of these seedlings on bare ground or growing between small grain drills were heaved out of the ground and are now dead. This occurrence of heaving of small sweetclover seedlings was observed during 16° - 20° F temperatures of January and February 1948. As a result of this observance the sweetclover seed of last fall's seedlings were concentrated in bands above the oat and phosphate drill (which was 2" below the top of the ground) by adapting special small seed spouts to the grain drill. We are confident that use of this special device which enabled the sweetclover seedlings to grow in association with the fibrous rooted small grain and to be in position to make quick contact with the phosphate band was responsible for the high survival of our sweetclover seedlings.

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Phosphate fertilization in the cold hardiness of Winter Oats - "The drilling of phosphate in contact with seed has resulted in more vigorous vegetative growth and more extensive root development of the less cold resistant varieties, i. e. Clinton and Logold-Bond x Fultex, 46-44-266, than in the cold resistant varieties of New Nortex and Fulwin x Lee-Victoria 3770-9. Low temperatures down to 24 degrees F prior to January 28 had caused no appreciable amount of cold damage to any of the varieties being studied."

Planting Sweet Clover in Wheat - Hugh C. McKay, St. Anthony, Idaho.-"In the preliminary study on methods of seeding sweet clover with grain as a nurse crop; some interesting results were obtained in both wheat yields and sweetclover stands. The following table gives the methods of seeding, the yield of wheat and stand of sweetclover obtained after harvest.

Methods of Seeding Sweetclover and Grass in Fall and Spring Wheat

Seeding Method	Wheat Yield	Sw. Cl. Stand
Winter Wheat		
1. Wheat seeded in fall-sw. cl. broadcast on wheat late fall	28.1	Fair
2. Wheat seeded in fall. Sw. cl. Broadcast on wheat early spring	25.2	Fair
3. Wheat seeded in fall. Sw. Cl. drilled in wheat early spring.	28.1	Good
4. Sw. Cl. seeded in alternate rows with winter wheat.	24.9	Poor
5. Sw. Cl. broadcast at time of seeding winter wheat.	26.8	Poor
6. Sw. Cl. mixed with winter wheat and drilled.	27.8	Poor
7. Sw. Cl. and grass mixed with winter wheat and drilled.	27.5	Poor
8. Sw. Cl. and grass seeded in alternate rows with winter wheat.	23.7	Poor
Spring Wheat		
9. Sweet clover broadcast with spring wheat	35.8	Good
10. Sw. Cl. seeded in alternate rows with spring wheat.	33.0	Very good
11. Sw. Cl. and grass seeded in alternate rows with spring wheat	31.7	Very good
12. Sw. Cl. mixed with spring wheat and drilled	33.3	Good
13. Sw. Cl. and grass mixed with spring wheat and drilled.	33.5	Good

"In comparing the grain yields for the winter wheat, the average yield of the regular 7 inch space drilling is 27.2 bu. per acre. The average yields from the alternate row seedings was 24.3 bu. per acre or 3 bushels less than the solid seeding. The same rate of seeding was used under both methods.

"In comparing the grain yields for the spring wheat the average yield for the solid seeding was 34.2 bu. per acre. The average yield for the alternate row seeding was 32.3 bu. or about 2 bu. less than the solid seeding.

"On the winter wheat trials only one satisfactory stand of sweet clover was obtained and that was when the wheat was drilled in the fall and the sweet clover drilled in the early spring over the winter wheat.

"In the spring wheat all methods of seeding resulted in a satisfactory stand of sweet clover.

"It was difficult to find much grass showing up during the summer time, but the last inspection in the fall showed a satisfactory grass stand showing up green in all methods of planting. The spring wheat seedings had a little more vigor and a better stand of grass."

Effects of Mowing Sweet Clover as Soil Moisture Tillage Difficulties - Glenn M. Horner, Pullman, Washington. - "Studies were started in 1948 to determine the effect of mowing sweetclover at different stages of growth on (1) total yield of clover, (2) tillage operations required for seedbed preparation following subsurface tillage, and (3) moisture removed from the soil. Clover yields and the soil moisture content data in the surface three feet at the time of subsurface tillage are given in the following table.

	Height of Clover When Cut			
	18"	30"	42"	Bud Stage
<u>Clover yield (lbs/A)</u>				
At cutting time	1374	2536	2938	4615
Regrowth on July 21	2572	1255	527	Trace
Total yield	3946	3791	3465	4615
<u>Soil Moisture (%) July 26</u>				
First foot	12.96	14.05	15.31	17.49
Second foot	16.05	18.41	21.05	22.13
Third foot	15.77	19.35	21.96	23.38
Average	14.93	17.29	19.44	21.00

"Bud stage represents the time that sweetclover is usually plowed under for green manure. All earlier mowing dates resulted in reduced yields, although for the 18", 30", and 42" stages, the amount of regrowth and the total yield decreased with delayed cutting dates. Soil moisture at the time of subsurface tillage was inversely proportional to amount of regrowth of clover. Seedbed preparation was greatly facilitated where the clover had been cut at the early stages of growth, because the material was not so coarse."

Steer Gains on Pasture Land Cleared of Moderately Stands of Mesquite Brush - C. E. Fisher, Spur, Texas.-"At the close of the 4th summer grazing season on native grassland at the Spur station, yearling steers gained 43 percent more per acre on pastureland cleared of a moderately heavy stand of mesquite brush. Fourteen head of the steers on the cleared pastures from April 10 to October 1, 1948 made an average gain of 206 pounds per head while steers on pastures with mesquite brush gained only 149 pounds. With feeder steers at \$28.00 per hundred-weight the increased value per steer on the cleared pastures was \$15.96 or an increased return of \$3.08 per acre. Over a 4-year period the cleared pastures have produced 15 percent more gain per acre and 27 pounds more gain per steer.

"The grass cover on the cleared pastures remains in good condition and shows moderate use in spite of the two long droughty summers in 1947 and 1948. On brush pastures stocked at the same rate, the grass cover shows very poor condition, extreme heavy use and large areas of bare soil where forage plants have perished due to heavy use of soil moisture and shading by mesquite.

"Moderate amounts of mesquite beans were available to steers on upland brush pastures during August and September yet the steers failed to show an increase in gain over those on cleared pastures where no mesquite beans were produced."

Annual Legumes Show Promise for Soil Improvement on Grain Land -- F. L. Duley, Lincoln, Nebraska.-"Most of the crop yields from our experiments for 1948 have been presented in previous reports. However, some of the annual legumes being tested gave results that show possibilities of producing considerable quantities of leguminous material for soil improvement. Partridge pea, a native annual, has been found to come for several years at least as volunteer from one seeding. Some fields seeded in 1945 have continued to give good volunteer stands (See the following table).

"Korean lespedeza (19604) has also shown considerable promise for eastern Nebraska conditions. This legume is a good pasture crop for late summer, but does not give as much total yield as partridge pea.

Yields and Nitrogen Content of Partridge Peas Under Different Conditions of Production.

Treatment	Total Tops		
	Oven-dry weight	Percent Nitrogen	Total Nitrogen
	Lbs./A	%	Lbs./A.
<u>Hastings Project</u>			
1. Partridge peas planted with oats 1948. Poorly inoculated	463	1.91	8.8
2. Selected volunteer areas in oats stubble - planted 1945	3413	1.78	60.8
<u>Lincoln Project</u>			
3. Wakelin Field, volunteer, no wheat planted 1947, dense stand	4819	1.96	94.5
4. Same as "3" but volunteer in wheat	2800	2.22	62.2
5. Field 27-III. Volunteer in wheat. first planted 1945. Dense stand	2077	2.14	44.4
6. Field 27-I. Wet bottom location. well inoculated, dense, 4' tall	5220	1.76	91.5
7. Wakelin Field. Volunteer, no wheat. planted in oats 1947.			
Tops	4760	1.45	69.0
Seed	289	6.20	17.9
Roots	<u>3399</u>	<u>0.45</u>	<u>1.4</u>
Total	5358		88.3

Earthworms as Stabilizers of Soil Nitrogen - Henry Hopp, Beltsville, Maryland.-"A plot near College Park, Maryland, was covered in the late fall of 1948 with a mulch of dead weeds, mainly crabgrass, for winter protection. The earthworm population in mid-January was 91 per sq. ft. or 3,900,000 per acre. Their weight per acre was 3,480 lb. fresh and 905 lb. oven-dry. Nitrogen content was found to be 6.5 per cent of the oven-dry weight.

"These worms therefore contained 63 lb. of nitrogen per acre, equivalent to almost 400 lb. of nitrate of soda. That is enough nitrogen to grow 40 bushels of corn without extra fertilizer!

"The first question is: Where did all this nitrogen come from?

"The second question is: In analyzing soil nitrogen, especially where the earthworm population is high, is it correct to continue excluding earthworms from the analysis sample?

"The third question is: If this large quantity of nitrogen is saved from leaching over winter by storage in the bodies of the earthworms, and if during the ensuing growing season, the mature worms reproduce and die, as is the normal course of their life cycle, may not the maintenance of the earthworm population be a way to promote the nitrogen nutrition of crops during the summer?"

Land Rest Treatments in Relation to Sugar Corn Yields in Different Seasons - O. R. Neal, New Brunswick, New Jersey. - "One of the practices that has been found to be effective in reducing soil and water losses and increasing the yield of subsequent crops is that of resting cultivated land for a year in close growing organic matter producing crops. During 1946 areas were rested in clover and timothy, ryegrass and vetch, green manuring with winter cover and soybeans, and in green manuring with winter cover and broadcast corn. In the soybean and corn treatments oats were used as a winter cover crop, which was disced down in the spring and either soybeans or field corn were sown broadcast. In early fall these crops were disced down and a winter cover crop of rye was drilled in. In 1947 these areas were planted to sweet corn as well as an area which had been in lespedeza sericea for two years. After the sweet corn was harvested a winter cover crop of rye was planted on all areas. In 1948 the areas were again planted to sweet corn as well as an additional area which had been in lespedeza sericea for three years. Both the 1947 and 1948 yields of sweet corn following these treatments are shown in the following table.

Effect of Land Resting on Sweet Corn Yields

Treatment	No. ears per acre	
	1947	1948
Continuously cultivated (check)	9600	2120
Clover and timothy	14780	4500
Ryegrass and vetch	15810	3650
Winter cover and soybeans	17910	5380
Winter cover and broadcast corn	10180	5800
Lespedeza sericea (2 years)	14670	6860
Lespedeza sericea (3 years)		7180

"The general level of sweet corn yields from all treatments and conditions in this study was much lower in 1948 than in 1947. The relative yield increases as a result of the resting treatments, however, were greater during the 1948 season."

The Conservation Value of Collecting Runoff Water From Higher, Sloping Land and Spreading it on Lower, More Level, Deep Permeable Soil, Wheatland Conservation Experiment Station, Cherokee, Oklahoma - Harley A. Daniel, Guthrie, Oklahoma. - "This experiment was started in the summer of 1944 by systematically designing and constructing level terraces on intervals of one foot in a 'syrup pan' (spread and spill) type arrangement. This forces the water to completely cross the field in the interval between each terrace.

"The area has been completely flooded nineteen times since the experiment was started. Six of these floods occurred during the growing season of 1948. As the water moved slowly back and forth over such a large surface, much of the surplus was absorbed by the soil (table 1). The water retained was used advantageously by alfalfa (table 2). This method of spreading and conserving the excess water increased the yield of alfalfa hay 47.8 percent in 1948. And it also prevented water from collecting in a pond that formerly developed in the northwest corner of the station. The 'syrup pan' (spread and spill) terraces, therefore, may serve some very important purposes on valuable wheat and alfalfa land typical of north-western Oklahoma:

"(A) In many places it has possibilities of increasing crop yields and at the same time provide the most desirable outlet for the excess runoff.

"(B) On other areas it may also be used to prevent the excess water from accumulating in ponds or destroying crops.

Table 1.--Amount of Moisture in the Soil on Unterraced and 'Syrup Pan' Type Terraced Alfalfa Land in 1948 at Cherokee, Oklahoma.

Foot Layer of Soil	Percent of Moisture ^{1/}	
	Unterraced	Terraced
1	11.9	14.4
2	11.3	14.5
3	10.0	12.9
4	8.3	12.0
5	8.7	11.4
6	8.6	10.5
6 Average	9.8	12.6

^{1/} Determined from samples taken in early spring and laterfall.

Table 2.-- Yield of Alfalfa Hay from Unterraced and 'Syrup Pan' Type Terraced Land in 1948, Cherokee, Oklahoma

Land Treatment	Hay Per Acre (Pounds)
Terraced	10,525
Unterraced	5,498
Increase	5,027

Nitrate Accumulation Under Several Systems of Grainland Culture - Maurice Donnelly, Riverside, California.-"The table below gives the nitrate nitrogen content in the fall of 1948 at the end of the summer fallow season on plots under several systems of culture. These plots are in the San Geronio Soil Conservation District, Beaumont, California. The key headings are briefly described as:

"Plow-Check. The initial spring operation was plowing with a moldboard plow carried on in the spring of 1948. No cultural operations were performed in the winter 1947-48. Summer weeding was with the rod-weeder with shovel attachments.

"Disk-Check. The initial spring operation was with a heavy disk, carried on in the spring of 1948. No cultural operations were performed in the winter of 1947-48. Summer weeding was with the rod-weeder with shovel attachments.

"Sweeps-Check. The initial spring operation was with a heavy sweep carried on in the spring of 1948. No cultural operations were performed in the winter of 1947-48. Summer weeding was with the rod-weeder with shovel attachments.

"Plow-Legume, Disk-Legume and Sweeps-Legume. The cultural treatments were as outlined above, with the addition that the legume purple vetch was grown on the plots in the winter of 1947-48. Because of poor weather conditions, purple vetch made only limited growth.

"Plow-Fertilized, Disk-Fertilized and Sweeps-Fertilized. The cultural treatments were as outlined above, with the modification that ammonium sulphate at the rate of 150 pounds per acre (30 pounds of actual nitrogen) had been applied to the plots in the fall of 1946 just before grain was planted.

"Mid-Winter Disk. The land was lightly disked in the fall of 1947. This operation buried most of the straw. Subsequent operations may have affected the nitrate accumulation. These data, admittedly scanty, on mid-winter disking are included because they do not, at the moment, give much encouragement that mid-winter disking will lead to a significant increase in nitrate accumulation.

"Fall-Chisel. The land was chiseled with a heavy tool in the fall of 1947. Fall chiseling, in a season when rainfall is sufficient to cause runoff, is regarded as a good water-conserving measure. Considerable straw is buried in the chiseling operation.

"Non-Tilled. The land was not tilled at all following grain harvest in the summer of 1947. Weeds were killed by oil spray.

"Check-On-Non-Tilled. The land was disked in the spring of 1948. Weed growth was controlled in the summer of 1948 with the rod-weeder with shovel attachments and with a disk.

"For this particular soil, one part per million of nitrate nitrogen in a slice six inches thick is equivalent to two pounds of actual nitrogen per acre.

Nitrate Nitrogen Content, Parts Per Million, September 1948, Houston Plots, San Geronio Soil Conservation District, Beaumont, California

	0-6"			6-12"			12-24"		
	Check	Legume	Fert.	Check	Legume	Fert.	Check	Legume	Fert.
Plow	15.2	15.4	12.0	1.5	1.4	1.5	0.8	1.0	1.4
Disk	9.7	9.2	14.9	1.4	2.8	2.8	0.9	1.1	2.5
Sweeps	9.4	9.1	13.1	1.2	1.2	2.1	1.1	1.0	1.2
Mid-winter Disk	11.7			1.0			1.2		
Fall Chisel	12.0			1.1			0.8		
Non-Tilled	10.8			1.3			0.9		
Check on Non-Tilled	10.6			1.2			0.8		

Nitrate Determinations by Dr. James P. Martin.

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.--"Rain or snow fell on 18 days of the month totaling 4.79 inches. This is 1-3/4 inches more than the normal amount. The greatest amount of runoff came from our poor-practice wheat watersheds - totaling 1.06 inches. Surface runoff from good meadow or woods did not exceed 0.2 inch. Therefore water absorbed by the soil ranged from 3.7 to 4.6 inches. Consequently soil moisture was very high and percolation to greater depths was large. Much percolation water seeped out to streams. Flow in the stream (drainage area 303 acres) was a combination of surface and seepage flow totaling 3.7 inches.

Table 1.--Runoff and erosion, January 1949

Watershed No.	Area Acres	Cover	Runoff In.	Erosion Lbs/Acre	Remarks
106	1.56	Wheat	1.06	3,956	
121	1.42	Wheat, manure	.68	109	
188	2.05	Wheat, mulch	.11	.8	
185	6.87	Wheat, meadow strips	.20	4.5	
115	1.61	Meadow, poor	.10	0	
123	1.37	Meadow, good	.71	0	Slow interval drainage
196	303	Mixed	3.7	no data	

Table 2.--Crop yields for 1948

Watershed No.	Crop-practices	Yield per acre	Remarks
130	Meadow-permanent	3.8 Tons	Alfalfa sowed in 1942
115	Meadow ₂ -poor	1.0 Tons	Drainage slow
123	Meadow-improved	3.0 Tons	" "
109	Meadow-improved	4.0 Tons	Drainage good
110	Meadow ₁ -poor	1.7 Tons	
103	Meadow ₁ - improved	3.0 Tons	
118	Wheat-poor	16 bu.	
113	Wheat-improved	27 bu.	
106	Corn-poor	56 bu.	
121	Corn-improved	77 bu.	

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"The biggest blizzard in Nebraska history occurred in January 1949, and was centered in the northwestern part of the State. During the month 1.04 inches precipitation was measured at our meteorological station, which is double the normal precipitation. Temperatures averaged 13.1°, compared to the long-time average of 24.7°.

"At the end of January it was estimated that the snow on the level averaged 10 inches deep, however, this figure was hard to estimate since many drifts along the roads that had been opened were above the tops of the cars, while only a skiff of snow remained on the open fields.

"The ground temperature recorder at the meteorological station shows that the ground is frozen to depth of about 18 inches. A week of warm weather or a warm rain would probably produce disastrous floods. It is hoped that the weather will moderate so that the floods can be diverted. In the past week the snow has disappeared some and it is believed that a large percentage of this has been in evaporation."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"Total January precipitation measured at the Throckmorton Farm was 7.23 inches, approximately 4-1/2 inches above the upper probable limit (95% level) of the 'normal' for the locality. Precipitation for the month at the Experimental Dairy Farm was slightly less. In 68 years' previous record for Lafayette, the only January precipitation exceeding 7.00 inches was in 1907, when 7.14 inches was recorded.

"It may be recalled from our previous report that December precipitation was also above 'normal', with substantial runoff occurring near the end of the month. Most of the January precipitation (recorded 20 days during the month) came as rainfall, fell on saturated or frozen soil and resulted in the most winter runoff experienced yet from our experimental watersheds. As has been common during such protracted wet periods a large part of the total runoff came from lateral movement of ground water. In most cases the temperatures fell below freezing during or immediately following the rain. In spite of our efforts, the records were seriously affected by icing in the measuring flumes. It will require considerable study and judgment to estimate runoff totals for the period.

"A summary and analysis was recently completed of our data on water losses from the experimental watersheds while in sod crops from 1942 through 1947. The specific quantities are none too revealing, due to wide seasonal variance, probably correlative with seasonal rainfall variations. However, the relationships of the runoff losses from the watersheds under the conservation treatment to those under the prevailing treatment are more conclusive.

5-Year Average runoff losses from meadow & pasture experimental watersheds
Purdue-Throckmorton Farm, Lafayette, Indiana
Percentages of Total Precipitation

Treatment	New Meadow 1/		Mature Mead. 2/		Diff. of Means	Perm. Pasture 3/	
	Mean	Std. E.	Mean	Std. E.		Mean	Std. E.
Prevailing	6.8	2.24	4.7	1.92	2.1	---	-----
Conservation	4.5	1.57	3.3	1.48	1.2	7.3	0.48
Ratio, o/p	0.66	0.04	0.70	0.10	---	---	-----
Difference	2.32	----	1.4	----	---	---	-----

LSD₀₅: Treatment = 2.72
Age = 2.72

- 1/ New Meadow, from date of wheat (nurse crop) harvest until May 1, following year. Includes meadow crops started in 1942 through 1945 and in 1947 (none in 1946, due to 4-yr. crop rotation with 3 crops/yr. on experimental watersheds).
- 2/ Mature meadow, from May 1, until sod was plowed under for corn, following spring. Includes 1945 through 1946, none in 1947.
- 3/ Permanent Pasture, 1943 through 1947 (computed by calendar years). Converted from rotation crops in 1941 with liming fertilization and seeding of blue grass and white clover. Grazing regulated."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.-
Precipitation for the month of January, as measured by the U.S.W.B. type of non-recording rain gages, amounted to 3.23 inches at the cultivated watershed, 3.25 inches at the wooded watershed, and 3.12 inches at the stubble mulch plots. These amounts are approximately 177 percent, 178 percent, and 171 percent of the 1.82 inches normal for East Lansing. Precipitation of 3.25 inches in January can be expected to occur once every 11-1/2 years according to the frequency curves prepared by Mr. Potter and the Project Supervisor. There were two rain and sleet storms and one snow storm during the month.

"There were five runoffs, of 0.5689, 0.0140, 1.1069, 0.005, and 0.1068 inches respectively, on watershed 'A' during the month. There was one runoff, of 0.0114 inch, from the wooded watershed; and six runoffs of 0.4466, 0.0010, 0.0010, 1.4280, 0.1088, and .1488 inches respectively, from watershed 'B'. These runoffs were occasioned by rain on frozen soil, snow melt, and ice melt. Soil losses were minor."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"At the Blacklands Experimental Watershed precipitation for the month of January totaled 4.16 inches. This is about 2.4 inches more than is normal for January. This is the first month since May 1948, when rainfall has been above normal here. Rainfall for April and May 1948, was slightly above normal and for January about normal. During 1947, the only months with above-normal precipitation were January, March, and December. Some other months had only very small amounts of precipitation. The total rainfall for 1948 was 24.37 inches compared to a normal of about 35 inches, or a total deficiency of slightly over 10 inches. The year 1947 had about the same total rainfall, so that the total shortage in moisture in the last 2 years has been about 20 inches.

"All of the moisture from the rains of December has been added to our soil-moisture supply. The only runoff that occurred during the month was from Gaging Stations C (800 acres) and D (1,100 acres). The amount of runoff was small and came from the areas with low water-holding capacities in the upper part of Brushy Creek. Both measurements at the watershed and observation show that there was no runoff from the deeper black soils in this area. Additional rainfall is needed to recharge depleted ground-water supplies and to start flow in the small streams of this area.

"The coldest weather for several years occurred January 30 and 31, with a low of 4° below zero. A snow totaling about 7 inches preceded the cold wave and it is anticipated that relatively little damage to winter crops has occurred. Oats apparently were not damaged by the temperatures of zero and below. They were in good condition prior to the freeze and were protected by the covering of snow. However, an estimated 25 percent damage to the fall-seeded Madrid and Hubam Clovers occurred, but unless the stand is further reduced by a similar cold wave, it is believed that reseeding of the areas will not be necessary, since the present stand will be thickened by seed which did not germinate in the fall."

Hydrologic Studies - E. H. Kidder, Auburn, Alabama.-"The monthly precipitation recorded at the North Auburn gage was 3.79 inches. This precipitation is 81 percent of the 40-year average of 4.68 inches reported in the 1941 USDA Yearbook. The average daily evaporation rate was 0.040 inch per day on Duncan Pond and 0.035 inch per day on Pond 4. As a whole, the month climatically speaking was very mild. Freezing rain fell during the early morning of January 30."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Edwardsville was 6.03 inches, as compared with the normal of 2.44 inches. The total runoff for the month was in excess of 4 inches. There were no high intensities, and rates of runoff were relatively low, even though the runoff during storms of the last few days approached 100 percent. Temperatures varied from a maximum of 66 degrees on the 15th to a

minimum of 7 degrees below zero on the 30th, with a mean for the month near normal.

"Precipitation at Fennimore was 2.18 inches, or about twice normal. Half of this amount was in the form of snow. Runoff occurred from rain and melting snow on three days during the first half of the month, and totaled about 1 inch."

Farm Ponds - T. W. Edminster, Blacksburg, Virginia.-"During January, six additional soils were treated and tested to find the lowest application of bentonite in a 5-inch mixed blanket to seal a soil against a 30-foot head of water. This makes a total of 11 soils on which this information is on hand.

"Thus far in the farm pond laboratory research study it appears that farm ponds can be sealed by compaction and by applications of bentonite supplemented either by compaction or puddling. Further, it appears evident that a partial seal can be obtained through dispersing agents.

"Of the eleven soils referred to above, no relationship is discernible between the effective particle-size distribution and bentonite needed to seal. Also there is no discernible relationship between the amount of bentonite needed and the initial percolation rate. Further analysis of these data will be performed upon completion of sedimentation curves for the successfully treated soils."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.-"Efforts during the month of January were concentrated on the development of a bucket-type outlet for O-ditch at the Whiting Naval Air Station near Milton, Fla. The attempt was made to spray the water into the air and let it fall on the delta so that the cost of the outlet might be reduced below the cost of a stilling basin. Although 17 different designs were tested, no satisfactory outlet design was discovered. The water was made to spray into the air all right, but strong sidewhirls developed which reached upstream and undermined the ditch for considerable distance. A cantilevered outlet design is now being prepared at the regional office and this will be tested to see if it is adequate."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Rainfall has been extremely low as will be noted from the following table giving records of total rainfall for the month of January. Rainfall varied from 0.02 inch at Highlands water control plot, to 0.56 inch at the corner of Plummer and Comfort Drives.

Location-Gage	January 1949	January 1948	January 1947
Redland, Mowry	0.37	3.25	0.94
Sub-Tropical	.25	3.70	1.45
Redland, Gossman	.51	4.89	1.60
Plummer, Comfort	.56	----	----
Peters, Florida	.31	3.59	2.42
Princeton Grove	.40	3.68	2.40
Cooper Grove	.29	3.50	1.70
W. Mowry	.30	3.78	.60
E-33	.02	2.60	.65
Roberts, Avocado	.31	1.70	1.47
Jeran Grove	.55	----	----

"Losses in water-table elevation for the period are as follows: For Redland, losses ranged from 0.54 foot at Well No. 2, to 0.75 foot at Well No. 15 on Gossman Drive. The average loss for all the wells was about 0.65 foot.

"For the Mowry Street profile the losses ran as follows: 0.45 foot at Well No. 31 just east of Homestead, to 0.87 foot at Well No. 26 at the west end of the Mowry Street profile. The average loss for the wells covered by this profile is approximately 0.7 foot.

"For the Eureka profile the losses were as follows: 0.73 foot at the west end of the profile, to 0.96 foot at the east end, 1/2 mile east of Peters, Fla.

"Losses this month were somewhat less than for the previous period though we have had actually no recharge from rainfall during the period. Readings at Well No. 5 on January 31, 1949, was 1.97 feet M.S.L.; January 31, 1948, 3.51 feet M.S.L.; January 31, 1947, 1.92 and January 31, 1946, 2.71 feet M.S.L. The daily average loss in water table for the period has been about 0.02 foot. Unless we were getting a recharge from the west and north, I believe the losses would be higher.

"During this period of low rainfall readings on the plots show that the shavings mulched area is leading during this period so far as conservation of moisture is concerned, followed by grass, pine straw, natural cover, and check plot. While it will conserve moisture somewhat better than other materials, greater care must be exercised in its use, as too heavy a layer will shed water in short heavy rains, and also it is resistant to weathering. Our data indicate that grass and pine straw is superior to shavings, for besides conserving moisture through decomposition, there is a release of nitrate. It will probably be several years before the shavings begin to break up."

Drainage Studies - T. W. Edminster, Blacksburg, Virginia.-"At Suffolk, the Project Supervisor assisted the Drainage Engineer in the calibration of gages, checking of equipment and in the study and observation of water table fluctuations through the use of soil moisture determinations on January 18, 19, and 20. The Drainage Engineer reports that tests conducted in November and December showed little or no effect from the filter on the water-table draw-down. The filter had been in operation about 10 days at that time and it was not believed that clogging would be as rapid as it has been. In an effort to establish an approach to studying the effect of the filter on pump point of action, a manual well (Number 327) was installed 10 inches from the pump well. It may be used in conjunction with either the manual wells or recording gages previously installed.

"The paper on 'A proposed modification of the method of reporting the degree of soil permeability in symbols' has been revised according to recommendations. While it is thought that the fiducial limits so estimated are valid for the block of soil being sampled, even more reliance could be placed on fiducial limits for an area sampled at random. In sampling a small block of soil the extraction of the first core disturbs the soil within a cylindrical volume having a diameter of approximately 10 inches. Hence, the next core must be taken at least 5 inches from the center of the first. In practice the volume of soil sampled is the minimum volume from which five undisturbed soil cores can be conveniently taken. If a larger volume of soil were sampled, there would be less relationship between the location of the soil cores in the volume of soil being sampled."

Drainage Studies - R. B. Hickok, Walkerton, Indiana.-"A paper 'Practical Aspects of Controlled Drainage of Muck Soils,' by R. E. Morris, formerly SCS technician on the Walkerton studies, was approved by the Service and the Experiment Station for early publication in AGRICULTURAL ENGINEERING. Mr. Morris is now agricultural engineer for the A. M. Todd Company, Kalamazoo, Michigan, and his paper is based both on results of the experimental work at Walkerton and his experience in his present position."

Supplemental Irrigation Studies - James Turnbull, Lake Alfred, Florida.-"During January the fruit was picked from the irrigation plots on the Experiment Station property. Yield and size records were obtained on Marsh grapefruit and on Hamlin oranges. Both the yield and the size of Marsh grapefruit were greater on the irrigated plots than on the unirrigated plots, the difference in each case being highly significant. The increased yield of Hamlin oranges from the irrigated plots was not significant but the increase in size was highly significant. The following tables show yield and size summaries."

Fruit Yield in Boxes per Tree
Citrus Experiment Station Grove - Block XVIII - Lake Alfred, Florida
1948 - 1949

Hamlin Oranges				
	1st Series Plots	2nd Series Plots	3rd Series Plots	Average Size
Irrigated	4.24	4.64	4.11	4.30
Unirrigated	4.22	3.61	4.22	4.03

Marsh Grapefruit				
	1st Series Plots	2nd Series Plots	3rd Series Plots	Average Size
Irrigated	9.18	8.62	8.04	8.61
Unirrigated	8.20	6.40	8.10	7.56

Statistical Analysis

The increased yield of Hamlin oranges on the irrigated plots is not significant.

The increased yield of Marsh grapefruit on the irrigated plots is highly significant.

Summary of Fruit Sizes
Citrus Experiment Station Groves - Blocks XVIII & XIX
Lake Alfred, Florida
1948 - 1949

Percentage of Fruit in Each Size - By Number of Fruit									
Hamlin Oranges									
	Size 324	Size 288	Size 250	Size 216	Size 200	Size 176	Size 150	Size 126	Ave. Size
Irrigated	2.0	15.0	34.9	13.9	24.2	5.7	3.7	0.6	215/bx.
Unirrigated	3.9	18.4	36.8	13.0	20.5	3.7	3.1	0.6	230/bx.

Marsh Grapefruit									
	Size 112	Size 96	Size 80	Size 70	Size 64	Size 54	Size 46	Size 36	Ave. Size
Irrigated	17.8	49.4	19.8	9.8	2.8	0.3	0.1	0.0	91.7
Unirrigated	34.0	45.5	13.0	5.5	1.7	0.2	0.0	0.1	95.9

NOTE:

Size indicates number of fruit per packed standard box of 1-3/5 bushels.

Statistical Analysis

The increase in size is highly significant for both Hamlin oranges and Marsh grapefruit.

IRRIGATION DIVISION

Water Evaluation Study - Salinas Valley, Calif. - Paul A. Ewing.-
Most important activity during the month was revision of the water evaluation study (Salinas Valley) previously reported as completed. This revision was made necessary principally by amendment of annual statistics issued by Monterey County Agricultural Commissioner. The amendments had to do with the figures for carrots and lettuce, and had the effect of materially increasing the beneficial values previously calculated. Other changes were of minor significance, but tended to strengthen the report. The Corps of Engineers is making 50 copies for use of the Division of Irrigation.

This report, while made for a specific purpose and reflecting the agricultural performance of two specific years neither of which can now be considered to represent a normal, will serve a useful purpose by illustrating a method of analysis occasionally applicable to other sections and conditions. The 50-copy edition will be used for such illustration.

Water Spreading for Recharge of Deep Underground Aquifers - A. T. Mitchelson, Dean C. Muckel, H. K. Rouse, Eldred S. Bliss, Curtis E. Johnson.-The Parshall flume at the headworks of the Upper Santa Ana River spreading grounds in southern California was visited twice during the month; once to check the recorder and put it into operation, and once again later when water was flowing to set the recorder with the staff gage reading.

Present indications are that this will be a good spreading year. There is approximately 7 feet of snow at Big Bear Lake on the Santa Ana River watershed, the most since 1916. It is possible that the maximum allowable amount of water spread on the Santa Ana spreading grounds will be reached this year. By court decree, the maximum that can be spread in any one year is 9,000 acre-feet and in-flows not to exceed 130 c.f.s. Last year there was only 420 acre-feet available for spreading at this location. Although snows in the higher elevation are considerably above normal, the rains on the valley are below normal. At Pomona, the season total is 6.30 as compared with an average of 9.60 inches at this time.

At Wasco in the San Joaquin Valley the buffer pond experiment was continued with both inner and outer (buffer) ponds in operation throughout the month. The rate of percolation in the outer (buffer) pond dropped quite rapidly and consistently from over 3 feet per day at the beginning of the month to less than 1-1/2 feet per day at the end. The rate in the inner pond also showed a proportionately comparable decline from 0.86 at the beginning of January to about half of that amount at the end. This decline in rate was not consistent since most of the decline occurred during the

first four days and from the 23rd to the 26th of the month. From January 5 to 22 inclusive the rate fluctuated narrowly in the vicinity of 0.60 foot per day but with a general downward trend. This behavior is reminiscent of the behavior of this pond during late November and early December while the outer (buffer) pond was shut off. It makes questionable the inference in our previous report that the leveling-off noted before and the resumption of a downward trend after water was turned into the outer (buffer) pond was due to lateral sub-surface flow.

Rates of percolation in the inner pond for successive five-day periods were:

Dec. 30 to Jan. 3, incl.	0.82 feet per day
Jan. 4 to Jan. 8, incl.	0.65 " " "
Jan. 9 to 13	0.62 " " "
14 to 18	0.58 " " "
19 to 23	0.57 " " "
24 to 28	0.45 " " "
29 to 31	0.46 " " "

Work was resumed on the preparation of the equipment for the set of replicate ponds, and it is hoped these replicate ponds may be placed in operation by the end of February.

Preliminary experiments with mechanical and aggregate analysis were continued. Consultations were held at different times with Dr. D. Aldrich of the Citrus Experiment Station, Mr. Martin Hubberty and Arthur Pillsbury of U.C.L.A., and Mr. Aronovici of the Division on best methods of performing these mechanical and aggregate analyses as well as other problems.

Considerable time was spent in collecting water samples from all ponds operating at Minter Field and wasco, and conductivity and Ph measurements were run on them. These preliminary trials indicate that changes in both Ph and conductivity are occurring in the ponds. It has been found that small variations in technique of running the samples cause considerable variation in the readings, that the length of time the sample is held prior to testing causes wide variations in the readings, and that samples taken from different places in the same pond sometimes cause wide variations in the readings. It will be necessary to continue these tests for some time before any conclusions as to significance can be drawn.

Laboratory work on field samples of soil and water from the test ponds was continued. Methods of obtaining plate counts of organisms were worked out. As soon as the pipettes now on order arrive, the plan is to follow the microorganism population from the time a pond is started until the intake rate levels off. Several ponds are now ready to be started. This study is to be in conjunction with Mr. Bliss.

A technique was developed for obtaining soil samples from the bottom of ponds while they are in operation. By this method fairly uniform samples of saturated soil can be obtained eliminating much of the variation in the soil-water ratio.

Preliminary tests were made of the possible antibiotic properties of partially decomposed cotton boll hulls collected from ponds. These tests will be continued.

Drainage of Irrigated Lands - San Fernando Valley - William W. Donnan, Los Angeles, Calif.-"Work was completed on the calculations for total acre-feet of water penetration below the root zone on irrigated crops. The study is being made to determine the effect of irrigation and rainfall on the high water-table problem area. Calculations were made for four different rainfall periods. The following tabulation indicates a wide variation between years.

Year	Rainfall characteristic	Total penetration below root zone, in acre-feet
1928-29	Dry year	0
1930-31	Normal year	9,260
1936-37	Wet year	24,400
1940-41	Extremely wet year	65,200

These data would seem to indicate that penetration of moisture below the root zone in wet, or extremely wet years would have a great influence on the water table. In those spot areas of the valley where the water table has been retained at a high level, due to artesian well leakage, the water table can be expected to be at or near ground surface during a wet year."

G. Marvin Litz, Los Angeles, Calif.-"A land-use survey of the area within the San Fernando Valley Soil Conservation District was made during the month. The survey was made, using aerial photographs with field identification made of doubtful areas. The land has been classified into irrigated, dry farmed, native vegetation and miscellaneous areas. Unit values have been computed for penetration of moisture below the root zone on various crops. These unit values, together with acreage of these crops, will be used to compute contribution to the water table from irrigation and rainfall."

Imperial Valley - George B. Bradshaw, Imperial, Calif.-"In 1941 the Service began an investigation of Drainage methods in the Imperial Valley. Various types of drainage have been investigated and to date tile drainage has proven to be the most efficient.

The following tabulation shows the growth of tile installation in the valley and the probable need for more drainage. The salt retained in the soil in 1948 was about 7 percent of the salt in the irrigation water. Until the time when there is a salt balance in the valley or the salt content of the soil is being reduced, there will be a drainage problem and a need for more tile. In some instances, by the increase in production, tile drainage has paid for itself in one year.

Year	Tile installed	Area of farms tiled	
		Per year	Total
	Miles	Acres	Acres
1930	11.97	606	934
1935	3.49	206	3161
1940	66.84	3944	23579
1941	46.08	2719	26298
1942	37.15	2191	28489
1943	53.24	3141	31630
1944	54.47	3214	34844
1945	55.40	3269	38113
1946	133.00	7847	45960
1947	325.00	19190	65150
1948	394.00	17220	82370

Water Requirements for Irrigation - Upper Rio Grande Valley - Harry F. Blaney, Los Angeles, Calif.-"Compilation of irrigation and consumptive use data were continued for areas in the Southwest. Tentative estimates of consumptive water requirements for irrigation of alfalfa, grass hay and pasture, late annuals, early annuals and cotton crops were computed for the following areas in the Upper Rio Grande Basin: (a) San Luis Valley, Colorado; (b) State line to Buckman, New Mexico; (c) Buckman to San Marcial, New Mexico; (d) San Marcial to Mesilla Valley, New Mexico; and, (e) Mesilla Valley, New Mexico. The consumptive water requirement for grass hay during the irrigation season varies from 20 inches in San Luis Valley to 36 inches in Mesilla Valley."

Irrigation Practices, Upper Santa Ana Valley - Dean C. Muckel, Pomona, Calif.-"In connection with studies on irrigation water penetration, records of water stock held by 280 irrigators were collected so as to determine the average annual application in Yucaipa Valley. These data were found in the applications made by individual irrigators to the Yucaipa Soil Conservation District for assistance. A very large proportion of the irrigation water is delivered through three principal water companies on a share basis, and an analysis of these records should represent valley-wide conditions."

Los Angeles West Coast Basin - V. S. Aronovici, Pomona, Calif.-"An analysis was made of the December soil moisture samples taken at soil moisture sampling stations of Los Angeles West Coast Basin. Penetration of rainfall has reached only 18 inches. Rainfall is still insufficient to establish field observations of field capacity. Acreages of soil groups within the basin are being planimetered."

Homer J. Stockwell.-Initial snow surveys indicate that February 1 snow cover is from 25 to 75 percent above normal.

R-3-2-1 #1 Friction Losses and Pipes and Fittings - Carl Rohwer.-The results of the tests of the friction losses through one 4-inch, two 6-inch, one 8-inch and two 12-inch gate valves at $1/4$, $1/2$, $3/4$, and full opening were plotted on large scale logarithmic cross-section paper. Friction losses for the complete range of discharges suitable for each valve will be scaled from these plots. On account of the fact that the flow through a gate valve is through a fixed orifice and a variable orifice in the case of check valves, less variation was noted in the plotted data for the gate valves than for the check valves. An analysis of the data on gate valves shows that the losses are small except when the valve is $1/4$ open.

R-3-2-1 #2 Performance Tests of Well Screens - Carl Rohwer.-Study of the losses through well screens was continued in the Laboratory in spite of the extremely cold weather. Mr. Corey ran tests on two different Johnson screens with $1/10$ -inch slots and one heavy wire mesh screen with $2-1/2$ openings to the inch. The tests were made on 3, 6, and 24-inch lengths of these screens to determine the effect of length of screen on the friction loss. Preliminary analysis of the data shows that for the same flow per unit length of screen, the losses increase as the length increases.

Snow Surveys and Water Supply Forecasting - W. D. Griddle, Boise, Idaho.-On the ninth of January, a report entitled "Snow Surveys and Irrigation Water Forecasts" was released from this office giving the snow water depths and relative information indicative of stream flow for the 1949 irrigation season. This preliminary report shows that on January 1 the snow water depths in Columbia Basin were much above normal for this time of the year. Throughout Idaho the water content averaged better than 150% of normal and over along the Cascades in Washington and Oregon, the water content ran from about 160% to 347% of normal.

Irrigation reports received prior to the end of the month indicated that the snow water content as of February 1 may have dropped down somewhat in relation to normal in the areas of Idaho but it still appears to be very high in Washington and Oregon. The complete report on the snow conditions as of February 1 will be released on the 9th of February.

During the month a draft of a progress report on the cooperative studies of consumptive use in Utah was prepared and sent to the Utah Agricultural Experiment Station for review and suggestions. This progress report includes the results of detailed studies on the amount of water used by agricultural crops and other land uses in the Ashley Valley and Ferron Creek Areas of Utah. These studies are to be a basis for administering the waters of the State of Utah and also to assist in administering the terms of the compact on the Colorado River by the Upper Basin States.

